CHP Integration with Fluid Heating Processes in the Chemical and Refining Sectors

Distributed Generation Improvements in Industrial Applications

Presented to:

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CHP Integration with Fluid Heating in Chemical and Refining Sectors

Objective

- Estimate the MW Potential of a Larger CHP Market as Compared to Traditional Steam CHP
- Evaluate Technical Issues Including Temperature Requirements and Process Integration
- Industrial Survey to Augment Field Findings
- Recommendations to Overcome Economic and Technical Hurdles

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Impact to CHP Opportunity in Chemical and Refining Sectors

- Based on Initial Analysis
- 18 GW of Remaining New Steam CHP Potential
  - Based on previous studies conducted by Onsite Energy
- 40 GW of New Fluid Heating CHP Potential
  - 30 GW in Refining based on fluid heating energy consumption
  - 10 GW in Chemicals based on ½ of fluid heating energy consumption
- 58 GW of Total New CHP Potential

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Scope of Work

PROGRESS

Completed

- **Task 1: Market Assessment**
  - Profile SICs, processes, equipment types, temperatures

In progress

- Estimate MW potential, develop economic criteria for U.S.
- **Task 2: Technical Feasibility**
  - Detailed evaluation of a fluid heating application at a representative site

TBD

- Investigate issues affecting feasibility of CHP integration
- **Task 3: Industrial Survey**
  - Recommendations and Discussion Paper
  - Perform Industrial Survey
- **Task 4: Final Report**

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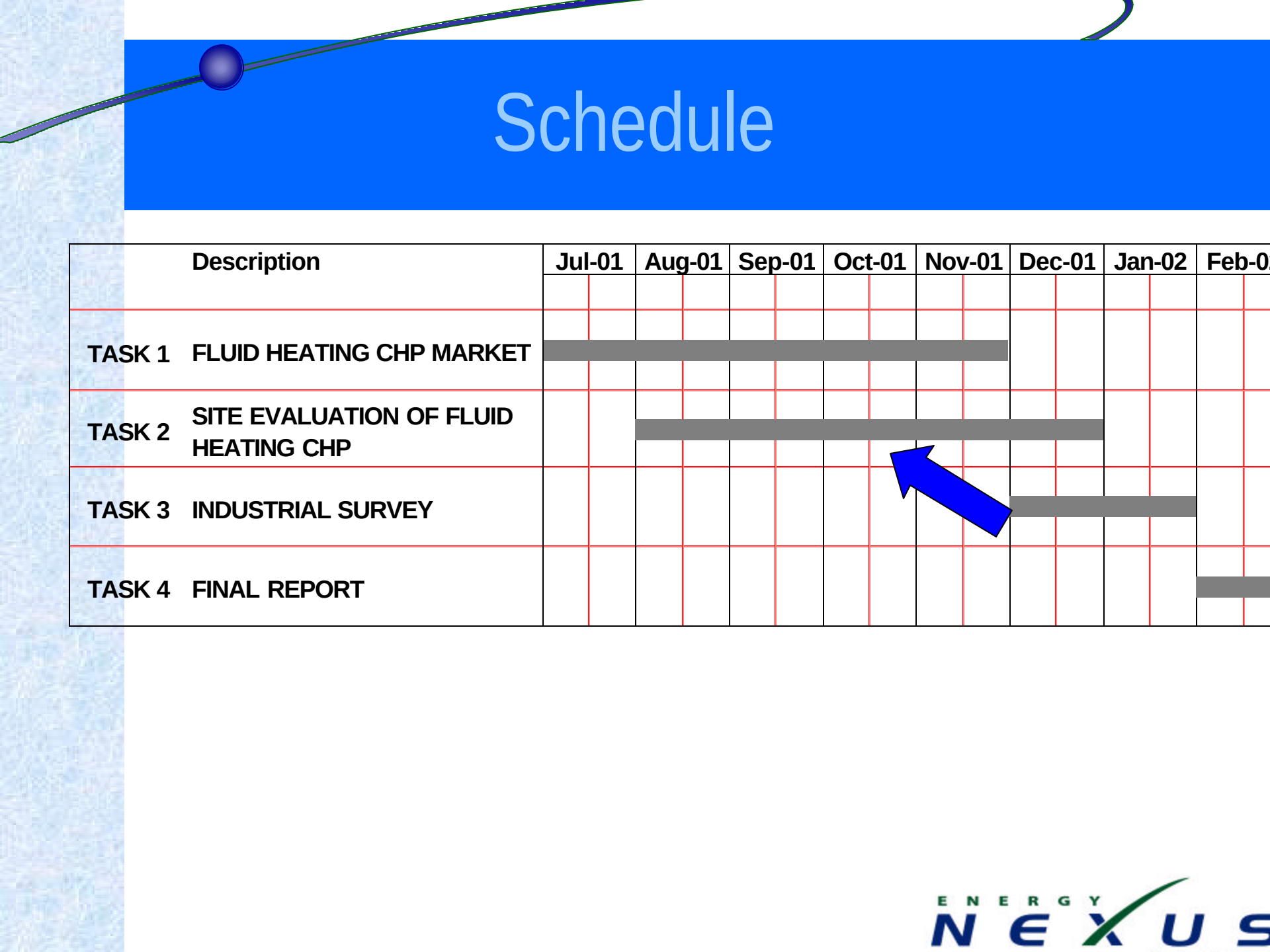
Schedule

	Description	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	Jan-02	Feb-0
TASK 1	FLUID HEATING CHP MARKET								
TASK 2	SITE EVALUATION OF FLUID HEATING CHP								
TASK 3	INDUSTRIAL SURVEY								
TASK 4	FINAL REPORT								



Progress to Date

- **Task 1: Fluid Heating Market**
  - Identified SICs, processes, fluid heating consumption
  - Refining Fluid Heating Typically <1000F (product heating)
  - Chemicals Fluid Heating Typically > 1000F (reactor temps)
    - Assume ½ fluid heating consumption for CHP as combustion air preheat
  - Evaluating Economic Criteria
- **Task 2: Site Evaluation**
  - Performed site visit
  - Evaluating site specific processes

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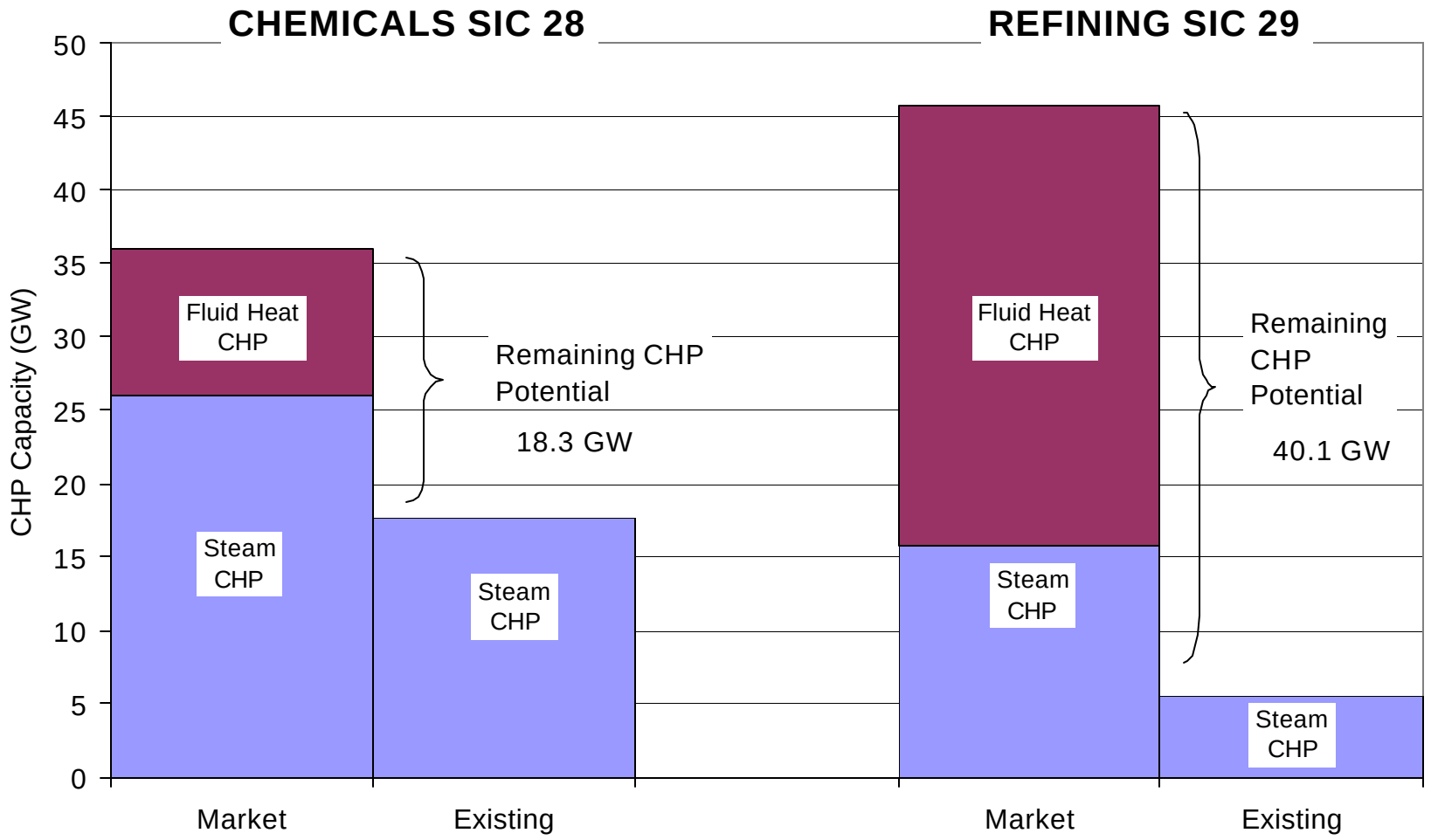
CHP Opportunities in Refining and Chemicals



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Fluid Heating Processes for Refining

Refining Processes	Fluid Heating CHP (GW)
Distillation	
Atmospheric	10
Vacuum	3
Coking	2
Catalytic Processes	
Reforming	8
Hydrocracking	1
Hydrotreating	4
Total	**28**

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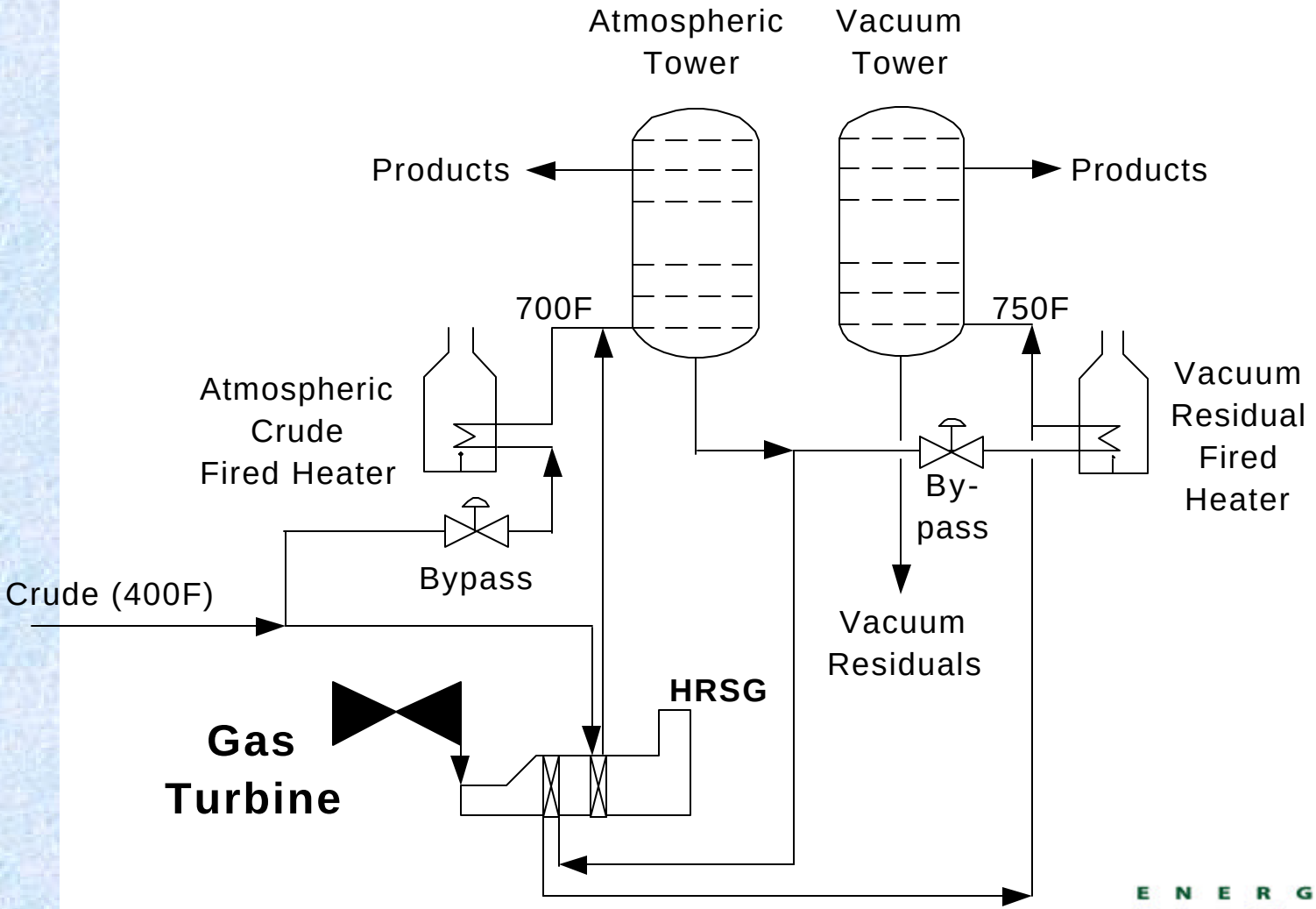
Example of Fluid Heating (Product Heating) for Refining Processes



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Fluid Heating Processes for Chemicals

Chemical Processes	Fluid Heating CHP (GW)
Ethylene	5.50
Ammonia	1.9
Carbon Black	0.57
Methanol	0.48
Vinyl Chloride	0.22
Styrene	0.24
Terephlhalic Acid (TPA)	0.24
Benzene, Toulene, Xylenes	0.18
Propylene Oxide	0.08
Total	**9.41**

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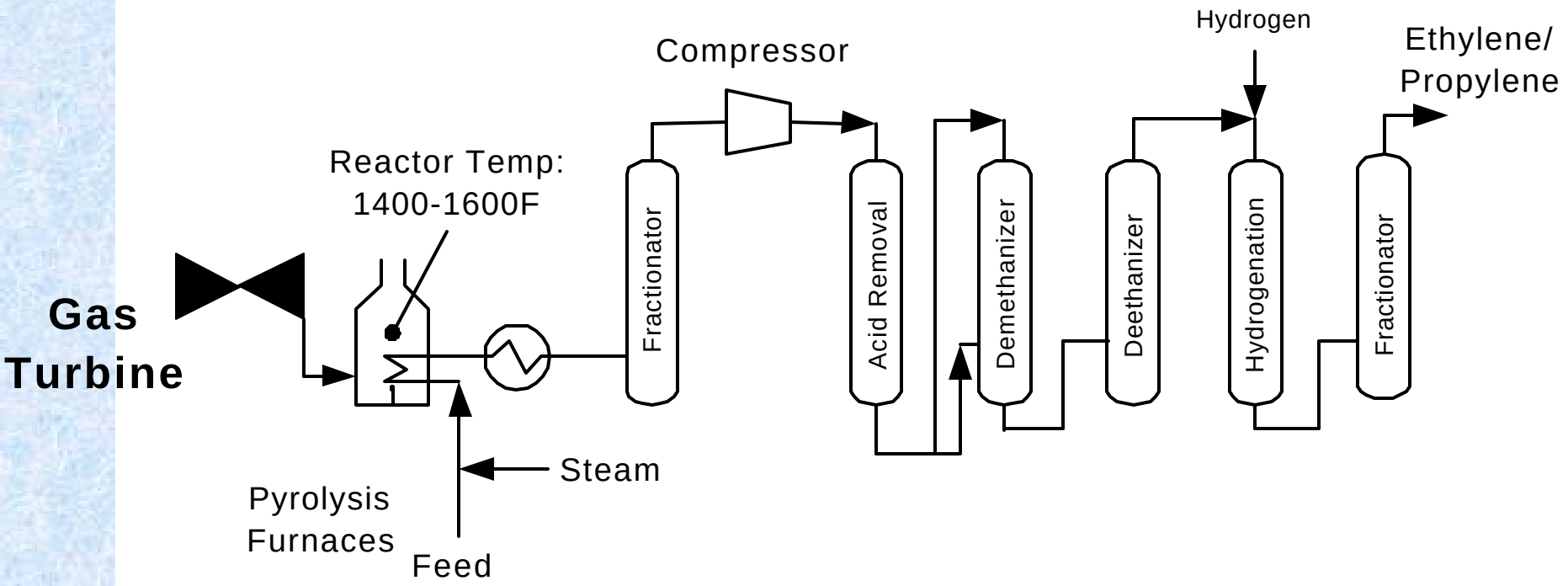
Example of Fluid Heating (Combustion Air) for Chemical Processes



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